

REMARKS/ARGUMENTS

Applicants have carefully studied the Examiner's detailed Office Action, and request entry of the above amendments in view of the remarks and arguments presented below. While applicants acknowledge the indication of allowable subject matter in pending claims 14 and 15, applicants submit that upon entry of the presently submitted amendments and in view of the following remarks and arguments, all pending claims will be in condition for allowance and request issuance of a Notice to that effect.

Objection to the Disclosure

Applicants have amended the disclosure to replace the Oxford English term "whilst" with the American English term "while", thereby rendering the objection to usage of this term moot.

Objections to the Drawings

Applicants have amended Figures 1 and 4 as follows: The amendments to Fig. 1 remove the letter "A", and formally identify the inner peripheral wall of the piston as "22d" and the peripheral portion of the valve member 44 as "44a". The amendments to Fig. 4 remove the letter "B", and formally identify the second end of the piston as "222c". Additionally, further review of this figure resulted in the identification of improperly labeled structure: the mixing tube was erroneously identified as "226" and the thermostatic element was incorrectly identified as "224". The amendments correct these erroneous identifications.

Claim Rejection – 35 USC § 112

Applicants submit that the subject matter in claim 6 relating to “an inner peripheral wall of the piston sliding along the elongate portion” was sufficiently described in the specification and drawings as filed. In this regard applicants draw the Examiner’s attention to the disclosure at page 2, lines 28 to 30, the paragraph bridging pages 6 and 7, the first paragraph on page 9 and Figures 1 to 3. Applicants invite the Examiner to further clarify this rejection should they be considered insufficient to address the reason for claim rejection.

Claim Rejection – 35 USC § 102

The Examiner has rejected claims 1 to 3, 5, 7 to 13, 20 and 22 as lacking novelty in view of US 6079625 (Lebkuchner). While applicants have amended the several claims for purposes of clarity, applicants submit that these amendments were unnecessary as the claimed invention clearly defines over the cited reference for the following reasons.

The invention disclosed in Lebkuchner describes a mixing valve including a body 112, a thermal actuator 114, a spool 116, a spindle 140 and a mixing chamber 160. The thermal actuator 114 includes a piston 130 and a cup 132. Hot water enters the mixing chamber 160 via the internal hot port 124b and cold water enters the mixing chamber 160 via the internal cold port 126b.

When the water contacting the thermal actuator 114 is too cold, the thermal expansion material within the cup 132 contracts, causing the piston 130 to retract away from the head of the spindle 140. Spool 116 is pushed towards the surface B by bias spring 118, allowing more hot water to flow through internal hot port 124b and less cold water to flow through internal cold port 126b, thereby increasing the temperature of the mixed water (see column 8, lines 42 to 52).

When the mixed water is too hot, the thermal expansion material within the cup 132 expands, causing the actuator piston 130 to push against the head of the spindle 140. This causes the thermal actuator 114 to pull the spool 116 away from the surface B of the body cover 120 and toward the surface A of the body 112. As the spool 116 is pulled towards surface A, the amount of hot water passing through the internal hot port 124b decreases and the amount of cold water passing through the internal cold port 126b increases (see column 8, lines 16 to 32).

Based upon this understanding, applicants submit that if the mixed water is still too hot, the thermal expansion material will continue to expand, pushing the actuator piston 130 against the head of the spindle 140 to ultimately close the internal hot port 124b (*i.e.* the spool 116 is in contact with surface A). This action will prevent entry of any hot water into the mixing chamber 160. If despite this action the thermal expansion material continues to expand, the piston 130 will continue to push against the spindle 140 and against the bias of the upper spring located within the temperature selection device 122. If the expansion force applied by the piston 130 to the spindle 140 can overcome the bias of the upper spring, then the spindle 140 can continue to move upwardly. If not, then the piston 130 and spindle 140 will be put under considerable force loading that may result in damage to the mixing valve or indeed catastrophic failure.

In contrast to the invention disclosed in Lebkuchner, the presently claimed invention provides an arrangement that allows for some continued expansion of the thermostatic element after the flow of hot water into the mixing chamber is prevented by virtue of a “slide through” hot seat configuration. More particularly, the present invention provides a second fluid seat formed on a valve member 44 or on part of the valve body 212a that is elongate and extends in a direction parallel to the direction of movement of the piston so as to allow the piston to continue to slide over the second fluid seat, thereby allowing for limited over travel of the thermostatic element 26.

Unlike the invention of Lebkuchner, the present invention provides a unique arrangement that allows for some continued expansion of the thermostatic element after the flow of hot water to the mixing chamber is prevented. It will be appreciated that stopping the flow of hot water to the mixing chamber will not immediately prevent the thermostatic element from continuing to expand. Indeed, there will be some delay before the effect of stopping the flow of hot water to the mixing chamber is felt by the thermostatic element. During this brief period, the thermostatic element may continue to expand and the present invention provides for such continued expansion. The present invention therefore provides a solution to a problem that may otherwise result in failure of the mixing valve.

As shown and described in relation to Figure 1 of the present application, throttling of the second fluid through the second fluid seat commences when the first end 22b of the piston approaches the valve member 44. Flow of hot fluid through the piston 22 will be prevented when the first end 22b of the piston comes into sliding contact with the valve member 44. Although hot fluid flow is prevented through the second fluid seat at this time, the piston can continue to move within the bore of the valve body 12 by virtue of a sliding engagement of the inner peripheral wall 22d of the piston 22 with the peripheral wall 44a of the valve member 44.

At paragraph 10 of the Office Action, the Examiner identifies the area of the internal cold port 126b of Lebkuchner as being equivalent to the "second fluid seat" of current claim 1. This being said, applicants fail to understand why the Examiner would consider the internal cold port 126b to be "configured to allow for movement of the piston as a result of continued expansion of the thermostatic element" as required by current claim 1.

Applicants' understanding is that the spool 116 of Lebkuchner is positioned away from surface B when the water in the mixing chamber is too hot, so as to allow more cold water through the internal cold port 126b (see column 8, lines 22 to 25). Accordingly, when the thermostatic element 114 is expanding the spool 116 is well clear of the surface B.

Applicants also fail to understand the Examiner's statement at paragraph 11 of the Office Action that the second fluid seat of Figure 2 of Lebkuchner is "formed as an elongate portion extending in the direction of movement of the piston 130 allowing the piston 130 to slide along the elongate portion". The Examiner's claim rejection is submitted as confusing given that neither the piston 130 or the spool 116 "slide along" surface B Lebkuchner when the thermostatic element 114 expands, or indeed at any other time.

The Examiner has also rejected claims 1, 8, 16 to 17 and 21 as lacking novelty in light of US 5203496 (Kline). For the following reasons, applicants submit that Kline also fails to operate as a valid reference in support of such rejections. As clearly depicted in Figure 1 of Kline, expansion of the thermostat 26 causes the piston 19 to move towards the bottom plug 21 against the bias of the spring 23. Modulation of the piston 19 variably opens the cavities 15 and 16 to the interior of the piston 19 communicating hot and cold fluid to the outlet 14a.

When the water in the mixing chamber 30 is too hot, the thermostat 26 will expand causing the piston 19 to move downwardly, thereby throttling the flow of hot water into the mixing chamber 30. If the water in the mixing chamber 30 is still too hot, the thermostat 26 will continue to expand until flow of hot water into the mixing chamber 30 is prevented. In this position, the piston 19 is located in contact with the upper surface of the bottom plug 21. Accordingly, if the thermostat 26 continues to expand, further movement of the piston 19 is not possible, which is contrary to the limitations of the pending claims. The resultant

force loading on the piston 19 and thermostat 26 may result in damage to the control valve.

Simply stated, the arrangement of Kline fails to disclose or teach a "slide through" hot seat configuration, in accordance with the presently claimed invention.

Claim Rejections – 35 USC § 103

The Examiner has rejected claims 4 and 6 as being obvious in light of US 6079625. Applicants submit that in light of the remarks and arguments above, such rejections are no longer appropriate. Similarly, applicants submit that the remaining rejections raised against claims 18, 19 and 23 must also be withdrawn.

Conclusion

For the reasons expressed above, applicants respectfully request that the Examiner withdraw the rejections/objections to claims 1-23 in view of applicants' remarks and issue an allowance for all claims pending after entry of applicants' amendments.

Applicants submit that this response has generated additional claim fees (three additional independent claims), and authorizes the Examiner to charge the appropriate excess claim fee to Deposit Account No. 07-1897. Should additional time be necessary in order for this response to be considered timely, please consider this communication as such supplemental petition and charge the additional fee to Deposit Account No. 07-1897.

While every attempt has been made to provide a *bona fide* response to the referenced office action, if the Examiner finds this response deficient in any way, he is respectfully requested to contact applicants' attorney of record by telephone, at (425) 455-5575.

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Respectfully submitted,

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